



Examiner: O. Davis

CRC : sew :



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

First Named
Inventor : David A. Broden
Appln. No. : 09/611,420
Filed : July 7, 2000
For : PRESSURE TRANSMITTER FOR
CLEAN ENVIRONMENTS
Docket No.: R11.12-0735

Appeal No.

Group Art Unit: 2855

Examiner: O. Davis

BRIEF FOR APPELLANT

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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23rd DAY OF March, 2004.


PATENT ATTORNEY

Sir:

This is an appeal from an Office Action dated September 17, 2003 in which claims 1-16 in the present application were finally rejected and in which claim 17 was not addressed.

REAL PARTY INTEREST

Rosemount Inc., a corporation organized under the laws of the state of Minnesota, and having offices at 12001 Technology Drive, Eden Prairie, Minnesota 55344, has acquired the entire right, title and interest in and to the invention, the application, and any and all patents to be obtained therefor, as set forth in the Assignment filed with the patent application and recorded on Reel 011296, Frame 0736.

RELATED APPEALS AND INTERFERENCES

There are no known related appeals or interferences regarding the present appeal.

STATUS OF THE CLAIMS

Claims 1-16 were originally presented. Claims 1-3 and 10-15 were cancelled by way of an Amendment mailed July 7, 2003; and claim 13 was added in that same Amendment. Thus, the pending and

rejected claims 4-9 and 16 are appealed herein. Claim 17 was not rejected in the Final Office Action, but depends from twice rejected independent claim 4.

STATUS OF AMENDMENTS

There are no unentered amendments.

SUMMARY OF INVENTION

I. INTRODUCTION

This invention relates generally to pressure transmitters. More particularly, the present invention relates to a pressure transmitter for use in clean environments.

II. BRIEF BACKGROUND

Certain industrial processes require relatively clean processing environments compared to general manufacturing processes. Examples of such clean processes include semiconductor manufacturing, pharmaceutical manufacturing, and food processing. In such environments, it becomes very important to ensure that all processing equipment can perform its required function without contaminating the process.

One device that has become highly useful in industrial processing environments is the pressure transmitter. A pressure transmitter is a device that senses fluid pressure within a process and provides an electrical signal indicative of the pressure to a control system. Generally, pressure transmitters have a pressure sensor that includes a deflectable diaphragm that deflects in direct response to pressure applied thereto, and which has an electrical structure on the diaphragm that varies its electrical characteristic in response to diaphragm deflection and thus pressure. Pressure transmitters that use a capacitive pressure sensor, are generally filled with a dielectric fill fluid that increases the capacitance of the pressure sensor to increase sensor resolution. However, in the event that such a sensor were to develop a leak, the dielectric fill fluid, which is occasionally silicone oil, would spill into the system thus

contaminating the product. Therefore, industrial processes which require very clean environments generally do not tolerate pressure sensors that use a fill fluid. Thus, pressure transmitters designed for such clean environments are generally required to sense process fluid pressure without the benefit of a fill fluid.

Although a number of pressure transmitters are known for clean environments, there is an ongoing need to provide simply and cost effective pressure transmitters for use in clean environments.

III. THE PRESENT INVENTION

The present invention provides a pressure transmitter for clean processing environments. The pressure transmitter for clean environments includes a pressure sensor module having an isolator diaphragm that is operably coupled to a pressure sensor. The pressure sensor can include a deflectable silicon diaphragm having elements thereon that provide an electrical characteristic that varies with diaphragm deflection. The isolating diaphragm and the deflectable diaphragm are separated from one another by an elastomeric filler material. In contrast to the prior art, the filler material is not a liquid, and thus will not leak out should the isolating diaphragm fail. This aspect is important for clean environments where even a small amount of contaminant can require that an entire processing line shut down and cleaned and/or refurbished. Examples of such environments include semiconductor manufacturing, pharmaceutical manufacturing and food processing. The elastomeric filler material ensures that the force received by the isolation diaphragm is effectively transferred to the pressure sensing deflectable diaphragm. Additionally, since, in some embodiments, the deflectable sensing diaphragm is a silicon diaphragm, the use of an elastomeric filler material coupling the isolator diaphragm to the sensing diaphragm helps eliminate the effect of step pressure increases on the system and thereby

potentially increase the longevity of the silicon diaphragm.

ISSUES

Whether claims 4-9, 16 and 17 are unpatentable over Olson (U.S. Patent No. 6,050,145) in view of Koen (U.S. Patent No. 5,461,922) under 35 U.S.C. § 103(a).

GROUPING OF CLAIMS

The claims do not stand or fall together, but are grouped as follows and each group is believed to be patentable.

Claims 4 and 9;

Claims 5-8 and 17; and

Claim 16.

ARGUMENT

I. INTRODUCTION

The present invention, in contrast to the prior art, provides a pressure transmitter suitable for use in clean environments. The pressure transmitter includes a process connection couplable to a source of process fluid, a pressure sensor module that is coupled to the process connection for fluidic communication with the process fluid. The pressure sensor module has an electrical characteristic that varies with the process fluid pressure. Measurement circuitry is operably coupled to the pressure sensor module and is adapted to provide a signal based upon at least one measurement of the electrical characteristic of the pressure sensor module. Communication circuitry is coupled to the measurement circuitry and provides pressure-related information to a process control loop. The pressure sensor module includes an isolator diaphragm positioned to contact the process fluid. A deflectable sensor diaphragm pressure sensor is positioned within the pressure sensor module and an elastomeric filler material is positioned between the isolator diaphragm and the sensor diaphragm. This arrangement provides pressure sensing that is better able to withstand repeated step-increases in pressure and configured such that if

the isolator diaphragm seal should fail, no filler will leak and possibly contaminate the environment around the pressure transmitter.

A. Prosecution of the Present Application

Appellants filed patent application Serial No. 09/611,420 on July 7, 2000. Subsequently, Appellants received a Non-Final Office Action mailed April 7, 2003 rejecting claims 1-16. Appellants responded by way of Amendment mailed July 7, 2003 canceling claims 1-3 and 10-15; and adding new claim 17. Thereafter, Appellants received a Final Office Action mailed September 17, 2003 finally rejecting claims 4-9 and 16; and not addressing claim 17.

B. Prior Art

U.S. Patent No. 6,050,145 (Exhibit A) to Olson et al. teaches a pressure transmitter with a high pressure isolator mounting assembly. The transmitter includes an isolator mounting assembly which isolates process fluid represented by arrow 24 from entering the interior of cavity 22. "A quantity of fill fluid provided in a passageway 28 transmits the process fluid pressure to a pressure sensor 30 provided in a sensor cavity 32, which is also filled with the fill fluid." See column 2, lines 43-51. The Final Office Action concedes that Olson et al. do not disclose a filler material that is constructed of an elastomer, being disposed between the isolator diaphragm and the sensor diaphragm.

U.S. Patent No. 5,461,922 (Exhibit B) to Koen teaches a pressure sensor isolated within a housing having an integral diaphragm and a method for making the pressure sensor. Koen discloses a diaphragm 36 and header body 22 that are formed of similar materials and constructed to be a unitary structure. A substantially non-compressible polymeric pressure transfer medium 21 is used to transfer changes in measurand pressure from the diaphragm 36 to the sensing device 23. Column 3, lines 62-67. The pressure transfer medium 21 of Koen, is, in one embodiment, a

gel that is cured in an oven at approximately 150°C for approximately two hours. See column 4, lines 35-37. Appellant respectfully believes that there is no teaching or suggestion in the disclosure Koen that the substantially incompressible cured gel pressure transfer medium 21 is or can be an elastomer.

II. THE REJECTION OF THE PENDING CLAIMS SHOULD BE REVERSED

A. Claims 4 and 9 are Allowable Over Olson et al. in View of Koen

Appellants respectfully believe that independent claim 4 is allowable in view of the following. Specifically, Appellants submit that the proffered suggestion by the Office Action for combining the teachings of Olson et al. with that of Koen is insufficient to support a prima facie case of obviousness. The Final Office Action asserted that, "It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Olson et al. according to the teachings of Koen for the purpose of, **providing a filler material to hermetically seal a pressure transfer medium between a gel-cup and a diaphragm.**"

(Emphasis added). The isolator system set forth by Olson et al. already provides an hermetic seal between the process fluid and the pressure sensor itself. Thus, one skilled in the art would not turn to additional resources to solve a problem already solved by the primary reference. Further, the Court of Appeals for the Federal Circuit has recently provided guidance with respect to rejections under 35 U.S.C. § 103. Specifically, the Court of Appeals has indicated that "particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed." In Re Lee, 61 U.S.P.Q.2d 1430, 1433 (Cafc. 2002) (citing In Re Kotzab, 55 U.S.P.Q.2d 1313, 1317 (Cafc. 2000)). Thus, Appellants respectfully submit that the Office Action has failed to set forth a prima facie case of obviousness because it has failed to indicate why one of ordinary skill in the art would

turn to Koen to modify Olson et al. Accordingly, Appellants respectfully submit that independent claim 4 is allowable over Koen and Olson et al., individually, and that the combination of such references is improper. Moreover, Appellants respectfully submit that dependent claims 5-9 and 17 are allowable as well by virtue of their dependency, either directly, from an allowable independent claim.

B. Claims 5-8 and 17 Are Patentable In View Of The
References Cited By The Examiner.

Claims 5-8 and 17 are directed to specific materials selected for embodiments of the invention. Claims 5-8, in particular, set forth different specifications for the filler materials. Claim 5 recites that the elastomeric filler is a polyurethane; claim 6 further specifies that the polyurethane is a polyether aromatic polyurethane; claim 7 specifies that the filler material is ST-1890-91 polyurethane; and claim 8 specifies that the filler material is ST-1880-87 polyurethane. With respect to these limitations the Final Office Action simply asserted that in Koen, "The filler material 38 is in the form of a polymer." The Final Office Action then concluded that it would have been obvious to modify the Olson et al. teachings according to the teachings of Koen for a purpose for providing a durable sealing material of which, in part, prevents extrusion of a medium. Respectfully, the specification of a polymeric filler material in Koen does not teach or suggest the elastomeric filler material useful with embodiments of the present invention. In fact, as Appellants indicated on page 9 of the specification,

"The selection of filler material 82 is relatively important for the long term viability of sensor module 46. For example, if material 82 is too rigid, it will counteract, to some extent, the pressure forces of the process fluid, thereby reducing the sensitivity of sensor module 46. Additionally, if the adhesive bonds between filler material 82 and sensor 80, or between filler material 82 and isolator diaphragm 76 should disengage, or otherwise delaminate, such condition can

introduce undesirable errors since deflection of isolator diaphragm 76 may not necessarily result in the appropriate deflection of sensor 80. Further still, it is important that the mechanical characteristics of filler 82 be relatively stable over the thermal operating range of HPT 14 such that temperature does not introduce unwanted variance into pressure measurement. Finally, a selection of filler material 82 should facilitate quick and robust manufacture of sensor module 46 such that high yields can be achieved while minimizing manufacturing costs."

The Specification then indicates that a number of different elastomers were tested as filler material 82. The specification lists eleven specific materials that were tested for their ability to perform as elastomeric filler material. Apparently, the Final Office Action simply dismisses all of this hard work and specification as the use of a polymer, which use is allegedly suggested by Koen.

Koen's recitation of a substantially incompressible polymer does not teach or suggest the use of an elastomer as set forth in Appellant's claims. The fifth addition of the McGraw-Hill Dictionary of Scientific and Technical Terms provides useful definitions for both "polymer" and "elastomer." Specifically, that dictionary defines a polymer as, "Substance made of giant molecules formed by the union of simple molecules (monomers); for example polymerization of ethylene forms a polyethylene chain, or condensation of phenol and formaldehyde (with production of water) forms phenol-formaldehyde resins." The same dictionary defines elastomer as, "A polymeric material, such as synthetic rubber or plastic, which at room temperature can be stretched under low stress to at least twice its original length and, upon immediate release of the stress, will return with force to its approximate original length." Thus, an elastomer is generally a polymer, but polymer is such a broad class of materials, that it does not teach, suggest or imply an elastomer. Accordingly, Appellant respectfully submits that even if the teachings Olson et al. and

Koen could be combined, such combination would fail to teach or suggest the specific limitations set forth in independent claims 5-8 and 17. Accordingly, Appellant respectfully submits that these claims are allowable over the art of record, taken alone or in combination.

C. Claim 16 Is Patentable In View Of The References
Cited By The Examiner.

Independent claim 16 was also rejected on pages two and three of the Office Action under 35 U.S.C. § 103. Claim 16 recites a pressure transmitter that includes many elements that are also recited in independent claim 4. However, the pressure sensor module is replaced with means-plus-function language in independent claim 16. Since the meaning of the means-plus-function element must be obtained by reference to the specific pressure sensor means disclosed in Appellants' Specification, Appellants respectfully submit that independent claim 16 is allowable over Olson et al. and Koen for the same reasons set forth above with respect to independent claim 4.

CONCLUSION

Appellants respectfully submit that independent claims 4 and 16 are allowable over the references cited by the Examiner. Also, Appellants respectfully submit that dependent claims 5-9 and 17 are allowable as well by virtue of their dependency therefrom. Thus, Appellants respectfully request that the Board reverse the Examiner and find that claims 4-9, 16 and 17 are in condition for allowance.

Respectfully submitted,

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Appendix A

[Claims]

1. Cancelled
2. Cancelled
3. Cancelled
4. A pressure transmitter for a clean environment, the pressure transmitter comprising:
 - a process coupling coupleable to a source of process fluid;
 - a pressure sensor module coupled to the process coupling for fluidic communication with the process fluid, the pressure sensor module having an electrical characteristic that varies with process fluid pressure;
 - measurement circuitry operably coupled to the pressure sensor module, the measurement circuitry being adapted to provide a signal based upon at least one measurement of the electrical characteristic;
 - communication circuitry coupled to the measurement circuitry and adapted to provide pressure-related information to a process control loop; and
 - wherein the pressure sensor module further includes:
 - an isolator diaphragm positioned to contact the process fluid;
 - a deflectable sensor diaphragm pressure sensor disposed within the pressure sensor module; and
 - filler material disposed between the isolator diaphragm and the sensor diaphragm, wherein the filler material is constructed from an elastomer.

5. The transmitter of claim 4, wherein the elastomer is polyurethane.
6. The transmitter of claim 5, wherein the polyurethane filler material is polyether aromatic polyurethane.
7. The transmitter of claim 5, wherein the filler material is ST-1890-91 polyurethane.
8. The transmitter of claim 5, wherein the filler material is ST-1880-87 polyurethane.
9. The transmitter of claim 4, wherein the filler is bonded to both the isolator diaphragm and the sensor diaphragm.
10. Cancelled
11. Cancelled
12. Cancelled
13. Cancelled
14. Cancelled
15. Cancelled
16. A pressure transmitter for a clean environment, the transmitter comprising:
 - a process coupleable to a source of process fluid;
 - means for sensing process fluid pressure, the means for sensing coupled to the process coupling;

measurement circuitry coupled to the pressure sensing means, the measurement circuitry being adapted to provide a signal based upon at least one measurement of an electrical characteristic of the pressure sensing means; and
a communication circuit coupled to the measurement circuitry and adapted to provide pressure-related information over a process control loop.

17. The transmitter of claim 4 wherein all materials of the transmitter are selected in accordance with requirements of Semiconductor Equipment and Materials International standards (SEMI).

Appendix B ****

5,461,922

6,050,145